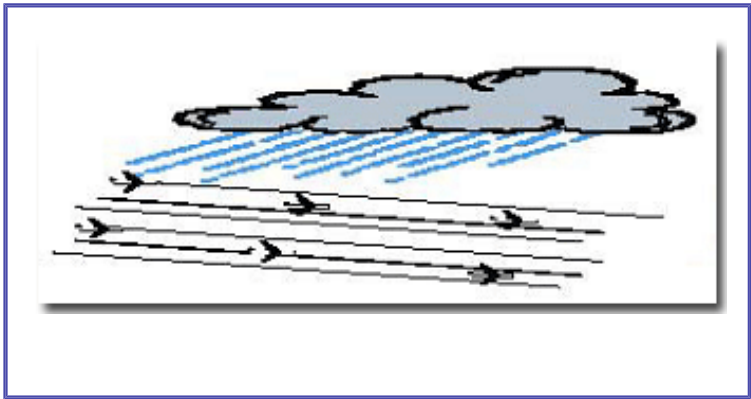


Operational Evolution Plan
Airport Weather Conditions

AW-1
Maintain Runway Use in Reduced Visibility



The reduction in arrival and departure rates as weather deteriorates is primarily due to loss of optimal runway configurations. The solutions presented here address the cases where inadequate instrument approach capabilities are the cause. Applying technology and procedures will provide instrument approaches under a wider range of meteorological conditions.

Capability will continue to increase as satellite navigation and RNP services become universally available over the United States airspace with upgrades to support instrument approaches. Airport improvements in runways, markings, and airport lights are necessary to match this increasing capability for approaches in poor visibility.

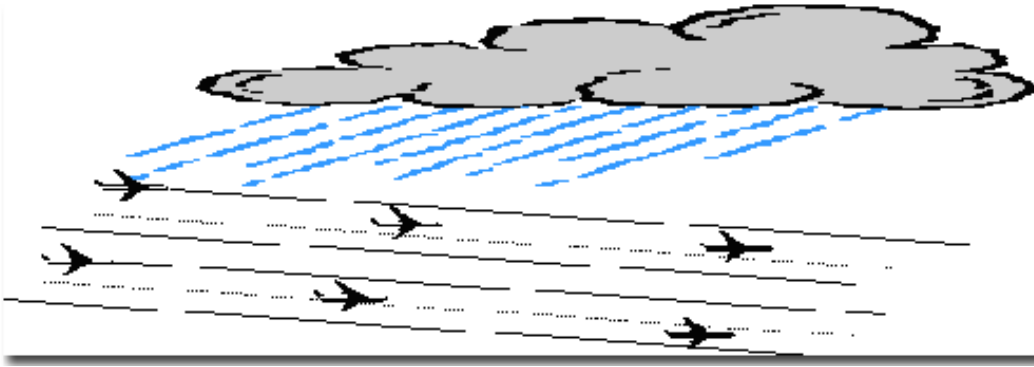
Key Activities:

FAA-Industry roadmap for RNP	7/03
Establish public approach criteria for RNP 0.3	9/03
Implement RNP Parallel Approach Transition for one airport	10/03
User inventory of equipment	10/03
WAAS commissioning	12/03
LPV approaches	12/03

Smart Sheet:
Version 5.0, December 2002

AW-1: Maintain Runway Use in Reduced Visibility

Optimize acceptance rates as weather deteriorates from Visual Meteorological Conditions (VMC) to Instrument Meteorological Conditions (IMC)



Background

There are three or more runway acceptance rates for each airport (based on benchmark analysis) – an optimum rate based on good weather conditions and two reduced rates based on marginal and adverse weather conditions, which may include poor visibility, unfavorable winds, or heavy precipitation.

Arrival rates deteriorate as weather changes from visual to instrument conditions. This premise is founded on the ability to provide visual separation between aircraft and for aircraft to achieve visual spacing for the runway. This standard acceptance rate reduction applies to single and/or parallel runway operations where the runways are separated by 4,300 feet or more. Two underlying factors that affect airport operations in periods of reduced visibility are:

1. Limitations of the instrument approach procedure(s) available at the airport; and
2. Inability to maximize runway acceptance when visual separation can no longer be applied.

Ops Change

The goal is to achieve near optimum runway acceptance rates without regard for meteorological conditions. At runways without an existing instrument procedure, the publication of Area Navigation (RNAV)-based instrument approaches provides a new capability within the NAS. For those runways with existing procedures but non-optimum runway acceptance rates, other tools/operational implementations are required.

Special approach procedures apply enhanced surveillance capabilities and offsets to allow continued arrivals at higher than otherwise permitted capacities on closely spaced parallel runways. These procedures will be published for NAS runways that are capable of supporting them. Procedures for all scheduled air carrier airports will be completed by 2006.

Capability will continue to increase as satellite navigation services become universally available over the United States airspace. Complementary airport improvements in runways, markings, and airport lights are necessary to optimize this increasing capability for approaches in poor visibility.

Instrument approach procedures will be published for most runway ends capable of supporting them. Procedures for Part 139 airports will be completed by 2006; procedures for public airports with runways more than 5000 feet will be completed by 2010. Capability begins with GPS-based non-precision approaches and continually increases, as vertically guided approach services (e.g., LPV, LNAV/VNAV) become universally available over the US airspace in the mid-term. The next step is to provide improved service capable of Category I operations.

New approach procedures will increase in both availability and usage as widespread equipage and operations are enabled by the new navigation services. Further, the implementation of these procedures will provide for stabilized vertical descent path capability for numerous airports. These approaches support the CAST initiative and the aviation community's goals to reduce controlled flight into terrain incidents. Increased usage of GPS-based RNAV procedures will increase efficiency at many airspace-constrained airports.

Use of RNP permits greater flexibility and standardizes airspace performance requirements. By adopting RNP and leveraging existing and emerging cockpit capabilities, the FAA in collaboration with the aviation community will be able to improve airspace and procedures design, leading to increased capacity and

improved efficiency.

The following sections address operational changes described:

AW-1.1: *Continue arrival rates at higher level as weather deteriorates from VMC to IMC by increasing instrument approach services.*

AW-1.2: *Introduce performance-based navigation requirements for all weather operations.*

Benefits, Performance and Metrics

Throughputs measured in arrivals per hour are sustained at a higher level as the ceiling and visibility decrease.

Increased runway acceptance rate, in arrivals per hour, under IMC weather conditions.

Increased IMC capacity and improved efficiency.

AW-1.1 Continue arrival rates at higher level as weather deteriorates from VMC to IMC by increasing instrument approach services.

Definition and Requirements for Instrument Approach Services

Due to the complexity of the terms used in this paper, a set of definitions that provide a foundation for the discussion of the detailed operational changes are presented below.

Non-precision approach (NPA) procedure – An instrument approach procedure based on a lateral path and no vertical guide path.

Lateral Navigation/Vertical Navigation (LNAV/VNAV) procedure – FAA Order 8260.3, Change 19 (RNAV Instrument Approach Procedures) includes a new minima line supporting instrument approaches with vertical guidance. LNAV/VNAV is the actual minimum line that denotes the provision of vertical guidance to a decision altitude (DA) in lieu of a minimum descent altitude (MDA) associated with non-precision approaches, typically based on barometric vertical navigation (VNAV).

LPV procedure – The FAA is developing a new approach procedure that exploits the capabilities of the Wide Area Augmentation System (WAAS). LPV approaches are scheduled to be available by December of 2003. Like LNAV/VNAV, LPV includes a new minima line supporting instrument approaches with vertical guidance. Smaller TERPS protection areas will usually result in lower minima for LPV approaches. Initial studies have indicated that this type of approach can achieve minima of 250' (height above threshold) and $\frac{3}{4}$ mile visibility. The addition of approach lights (see Category I below) may reduce visibility by $\frac{1}{4}$ mile.

Precision approach (PA) procedure – An instrument approach procedure based on lateral path and vertical guidance.

Category I – Category I operation is a precision instrument approach and landing with a decision altitude that is not lower than 200 feet (60 meters) above the threshold and with either a visibility of not less than $\frac{1}{2}$ statute mile (800 meters), or a runway visual range of not less than 1,800 feet (550 meters).

Category II – Category II operation is a precision instrument approach and landing with a decision height lower than 200 feet (60 meters), but not lower than 100 feet (30 meters), and with a runway visual range of not less than 1,200 feet (350 meters).

Category III – Category III operation is a precision instrument approach and landing with a decision height lower than 100 feet (30 meters) or no decision height, and with a runway visual range less than 1,200 feet (350 meters).

Scope and Applicability

Near-Term:

New RNAV Procedures. Standard Instrument Approach Procedures (SIAP's) for 576 airports, serving Part 139 airport operations, are in development and will be completed by 2009. As of August 2002, a total of 422 RNAV procedures have been published for 94 of the 576 airports. A total of 203 RNAV procedures have been designed for 33 of the 35 FAA's benchmark airports. A total of 180 RNAV procedures have been published for 27 of the benchmark airports. Procedures for the remainder of the benchmark airports (DCA, IAD, LGA, PDX, PHL, MDW, & TPA) are scheduled for publication prior to August 2003.

New precision approach services. Precision approach capability will be established, improved, or sustained with ground based navigational aids (GBNA) within the NAS, using ILS and ancillary aids like approach lighting systems, runway visual range systems, distance measuring equipment, and visual glidepath indicator equipment.

WAAS will be commissioned in 2003. The initial WAAS service will support LNAV/VNAV and LPV.

Mid-Term:

WAAS will expand to support LPV services throughout most of CONUS and Alaska by 2007.

LAAS will provide precision approach services to Category I minima, and procedures will be developed and available for each LAAS installation scheduled for in the fourth quarter of FY06. The six initial sites are Houston, Juneau, Seattle, Chicago, Phoenix, and Memphis.

RNAV Instrument Approach Procedures: 780 public airports with runways over 5,000 feet will receive RNAV procedures over the mid term extending into the long term, to be completed by 2010.

Long-Term:

Although approximately 1,100 NAS runway ends are equipped to support precision approach service, many of the approximately 3,000 non-precision approach runway ends in the NAS require airport infrastructure upgrades to support precision approach services. Visibility minimums of 1 mile can be supported with visual runway markings and low intensity runway lights (LIRL) for nighttime operations. Medium intensity runway lights (MIRL) and precision or non-precision runway markings are required to reduce visibility minima to $\frac{3}{4}$ mile. To establish $\frac{1}{2}$ mile-visibility minimums the additional equipment requirements are precision runway markings, MIRLs for nighttime operations, and an approved approach lighting system.

For most paved public airports, GPS/WAAS precision approaches will support the publication of minima to one mile visibility without requiring significant airport improvements in marking, lighting, and signage; however, only Part 139 and public airports with 5000' runways will have instrument approach procedures by 2010. Procedures for the remaining 1,300 public airports with paved runways (with runways less than 5,000 feet) will be completed after 2010.

Key Decisions

A decision will be made in 2005 to determine how to proceed with decommissioning some VOR facilities.

A decision will be made in 2006 to determine which ILS facilities will be decommissioned beginning in 2010.

A LAAS business case and research studies to develop CAT II and III LAAS system performance and design requirements will lead to a decision on how to proceed with LAAS in 2005. In addition, operational requirements for complex procedures will be determined, and the MOPS and MASPS developed, allowing a decision on the inclusion of complex procedures at the 6 initial LAAS sites.

Key Risks

Funding to develop, procure, install, and commission the above planned services.

Geo-stationary satellite leases/acquisition risk for WAAS service.

- Timing and availability of WAAS/LAAS services.
- Voluntary user equipage and usage of WAAS/LAAS avionics/capability.
- Schedule for production version of WAAS/LAAS receiver.
- Environmental and airport infrastructure constraints.

AW-1.2 Introduce performance-based navigation requirements for all weather operations.

Scope and Applicability

The FAA has committed to develop and implement a plan to establish RNP airspace and procedures throughout the National Airspace System (NAS). As a result, we may achieve reduced terrain, obstacle and aircraft separation standards.

RNP airspace and procedures take advantage of aircraft's on-board navigation capabilities. These RNP procedures will result in increased levels of navigation accuracy and flight path predictability. This smart sheet addresses the approach phase of flight. Terminal and En Route phases are addressed in other smart sheets.

Near-Term:

- FAA will develop and implement a plan to establish public use RNP airspace and procedures in United States domestic airspace. The FAA will work with industry to develop an FAA / Industry Roadmap for RNP by July 2003.

- FAA will develop and publish public approach design criteria for RNP in FY03.

- Determine the requirements for the removal of "DME/DME not authorized" on current RNAV approach plates by 1st Quarter FY03.

- RNP Parallel Approach Transition (RPAT) is the equivalent of conducting simultaneous instrument parallel approaches in IMC. The RNP Program will implement the RPAT operation at one airport in FY03. Initial candidates include Seattle and Cleveland.

Mid-Term:

- FAA will publish approach procedures based on RNP 0.3 in FY05.

- There will be public RNP approaches for smaller RNP values and complex procedures, including the missed approach procedure. These procedures will require special aircrew and aircraft authorization. The FAA will continue implementing specials.

Key Decisions

- Determine how to operationally manage DME/DME-based RNAV operations. The coverage and geometry of DMEs varies by procedure, and the required DME infrastructure to support a given operation depends upon the specific FMS. Several options include asking the operators to evaluate DME coverage and geometry to support specific procedures using their specific FMS, or establishing a minimum standard against which the FAA could accomplish this assessment. Flight inspection requirements must also be defined.

- Determine if RPAT can be used to conduct approach operations to runways spaced closer than 4300 feet without the need for high-speed radar (1 second update precision runway monitors).

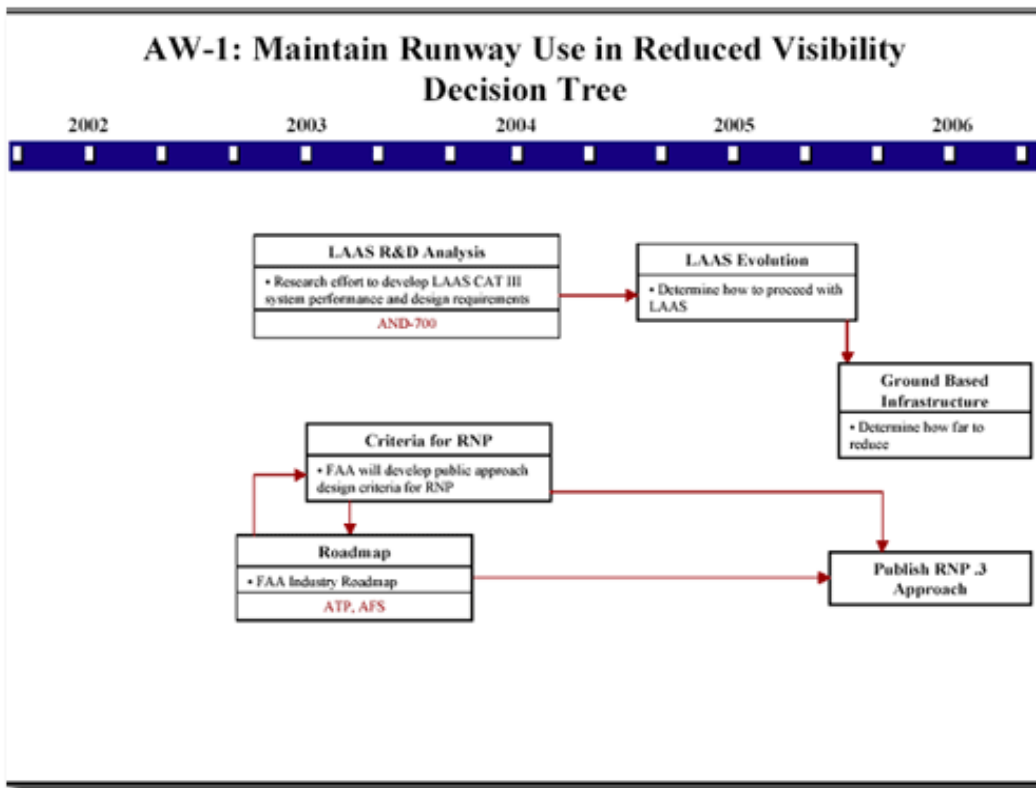
Key Risks

- Consistent funding and resources.
- Industry equipage levels and consistency of avionics.
- Verification of DME/DME minimum standards.

DME/DME siting, decommissioning, and relocation.

User and service provider acceptance of RPAT.

Decision Tree



[View enlarged decision tree](#)

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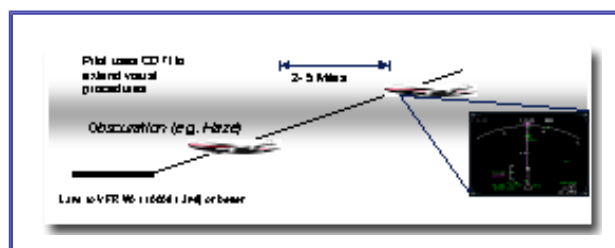
Working Forums

Other Websites

[Relationship to the Architecture](#)

AW-2

Space Closer to Visual Standards



Procedures for visual approaches require that the pilot visually acquire nearby aircraft as well as the runway. In marginal visibility conditions, pilots may have difficulty visually acquiring the runway or nearby aircraft, reducing arrival rates. Cockpit tools and displays can help to achieve higher throughput by enabling more rapid identification of aircraft, reducing the need for additional communications between the pilot and controller to advise on traffic. The cockpit display indicates target aircraft and trajectory information that the pilot can correlate to what is visible, providing faster target identification and helping the pilot maintain visual separation. This plan outlines two efforts. The first is an in service evaluation of the Enhanced See and Avoid application currently approved for use by UPS aircraft equipped with ADS-B operating at Louisville Standiford Airport (SDF). The second effort builds on this work by expanding the application to enable “visual” approaches.

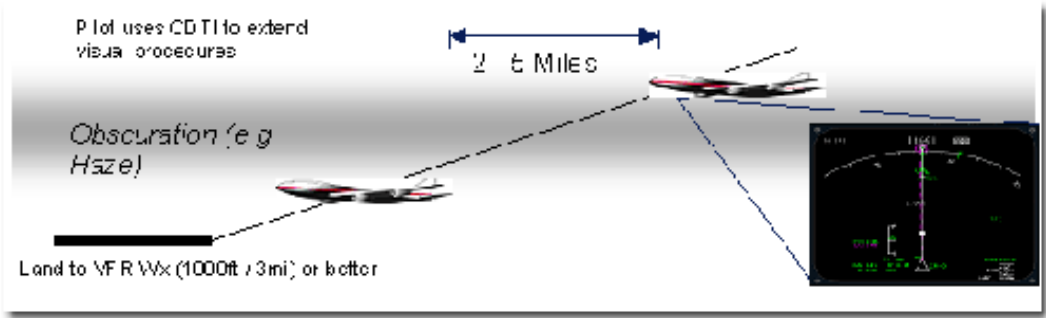
Key Activities:

Determination of whether to proceed to high fidelity simulation of continued visual approach	5/03
Publish Data collection plan for SDF	10/03
Begin Metrics collection of at SDF to identify benefits provided by ADS-B for Enhanced Visual Approaches	11/03
High Fidelity Simulations of continued visual approach	1/04
Determination of whether to proceed to flight testing of continued visual approach	4/04

Smart Sheet:
Version 5.0, December 2002

AW-2: Space Closer to Visual Standards

Using cockpit tools and displays to achieve VFR throughput capacity in all weather conditions.



Background

The difference between Visual Flight Rules (VFR) and Instrument Flight Rules (IFR) capacities are significant – for example, at Dallas-Fort Worth International Airport, VFR arrival rate is 150/hour; this degrades to 95/hour when visual approaches cannot be performed. Typically, up to 30-40% of capacity is lost when weather criteria forces the airport to IFR operations.

Most airports have established weather minima below which visual approaches cannot be conducted, primarily due to the difficulty for the pilot or controller to visually acquire the runway or traffic in such weather. Currently, the requirement for visual approaches is ceiling 500 feet above minimum vectoring altitude and visibility 3 miles or greater. However, other environmental conditions such as haze, sunlight,

smoke, and patchy clouds may effectively prohibit visual approaches at higher ceiling and visibility values.

The use of “Cockpit Display of Traffic Information (CDTI) Enhanced Flight Rules” (CEFR) may present the opportunity to use CDTI as an extension of the pilot’s eyes, thus enabling visual approach operations to continue in marginal VFR, and potentially down to instrument conditions. The research program summarized in this smart sheet provides an outline of the activities underway to develop an application demonstrating this capability.

Ops Change Description

The operational change for this initiative is described in the following sections:

AW-2.1: There is no significant operational change in the initial application for use of the CDTI; however, it is expected to demonstrate efficiency benefits. The CDTI assists the pilot in visually acquiring and identifying an aircraft that has been referenced as traffic by Air Traffic Control (ATC), so the controller may clear the aircraft for a visual approach. This is a critical building block for future applications, such as the one described in AW-2.2.

AW-2.2: The CEFR concept would support Continued Visual Approach into marginal weather conditions. This would allow “visual-like” approaches to continue during periods when conditions do not permit continuous visual contact with traffic to follow. Conducting “Visual-like” Approaches under the CEFR concept would allow the approach to continue during periods of intermittent loss of visual contact. This application would be especially effective in restoring lost capacity at airports during conditions of darkness, haze, fog, thin cloud layers, marine layers, or other obscurations.

The initial application development is centered on the ability to perform this on a single-runway approach, as this would be the most basic form of this procedure. However, the application is being developed with the objective of performing this application with parallel runway configurations. The developers recognize that the majority of benefits will accrue with the enabling of parallel runway operations.

Benefits, Performance and Metrics

- Reduction in en route delays resulting from better flows into airports.
- AW-2.1: Improved airport arrival throughput. Operational experience, and pilot and controller acceptance of Enhanced Visual Approach has a potential of 1 percent to 3 percent improvement in airport arrival rates at Louisville/Standiford Airport (SDF) with significant equipage.
- AW-2.2: Allow airports to continue visual arrival rates to lower actual weather conditions, and reduce the frequency and duration of ILS operations (individual airport throughput capacity varies, but is typically lower during ILS operations). Initial estimates of benefits show a potential annual savings of approximately 520,000 minutes of airborne delay if CEFR can be applied to MVA + 500 feet at the 31 benchmarked airports, and 1,090,000 minutes if CEFR can be used to basic VFR (1000' ceiling / 3 miles visibility). This assumes that CEFR will allow the airports to remain in their optimum configuration for arrivals/departures.

Additional Benefits: See *Safe Flight 21 Pre-Investment Analysis Cost Benefit Analysis Phase II Report*, 1 May 2001

AW-2.1 Enhanced Visual Approach

Scope and Applicability

The use of the CDTI assists the pilot in visually acquiring and identifying an aircraft that has been referenced as traffic by Air Traffic Control (ATC), so the controller may clear the aircraft for a visual approach. The CDTI enables quicker identification since the pilot will be able to correlate the target aircraft and trajectory information from the CDTI to the actual traffic as seen out-the-window. Another objective is to better enable the pilot to obtain and maintain visual separation once it is initially established.

With quicker identification of pertinent traffic, the need for additional traffic advisories by ATC or follow-on interactions between the pilot and controller should be reduced. No changes to FAA Order 7110.65 (Air Traffic Control) are required for this initial application.

In order to familiarize and give confidence in the equipment to flight crews of CDTI capabilities, this application will entail use of the CDTI during regular visual approach operations with no changes to the current procedures, visibility, or weather criteria. This will enable pilots to maintain better awareness of position and speed of traffic being followed.

This on board equipment has STC approval and will be evaluated in routine operations at SDF. Data collection and analysis to validate potential improvements will be implemented when user equipage reaches significant levels. UPS is equipping their aircraft, and expects to complete equipage by November 2003. A 12 to 24 month data collection and metrics effort will begin by the end of FY03.

Expansion of this capability will be dependent on a demonstrated benefit based on the metrics collection effort. Future implementation will be on an airport-by-airport basis based on equipage capability and potential benefits.

Key Decisions

- UPS continued commitment to equip entire fleet with approved Level 1 avionics (107 aircraft by November 2003).
- UPS acceptance of demonstrated benefits and decision to keep their aircraft equipped with ADS-B (no later than December 2005).
- Site selection for further implementation based on collaborative decision between affected parties (e.g.: aircraft operator/pilots/FAA).

Key Risks

- Feasibility of procedures in mixed equipage environment.
- Impact of mixed equipage on achievement of benefits.
- Equipment fielding schedule of UPS aircraft.
- Lack of demonstrated benefits from the metrics collection and analysis.

AW-2.2 Continued Visual Approach

Scope and Applicability

The context for application development is to keep the Continued Visual Approach as close operationally as possible to current Visual Approaches as defined in 7110.65, other than changing weather minimums in which they are authorized. This includes keeping the transfer of separation responsibility to the flight crew, as happens under current visual approaches. ATC techniques would remain the same in the Continued Visual Approach. The application design objectives for phraseology and other aspects of the application are similarly intended to be the same as under visual approach today. It is intended that this concept be used in conditions such as haze where visibility with aircraft to follow cannot be maintained, but all aircraft remain in VFR weather conditions (3 miles visibility and clear of clouds) as well as conditions resulting in short term periods of IMC such as penetration of a marine layer or scattered/broken cloud layer.

The exact application evolution will depend on the requirements determined to produce a CDTI with appropriate tools for the flight crew to ensure safe separation. A notional application evolution is as follows:

In the near-term, focus will be on the single-runway approach as well as parallel runway operations in marginal VMC only. In this level of the application, if the pilot has already established visual contact with traffic to follow while in-trail during a visual approach and that traffic has been correlated with CDTI symbology, then CDTI and appropriate tool set will permit the pilot/flight crew to maintain separation when visual contact is lost. Visual contact must be re-established in time to re-acquire the traffic and perform a stabilized approach to the runway. This will allow ATC to continue visual approach operations as long as VFR weather conditions exist at the airport. However, no change to ATC technique, procedure, or phraseology is anticipated or desired.

Progress is being made on research to resolve issues, driving toward obtaining certification and operational approvals.

- During FY02, the Safe Flight 21 Strategic Support Group (SSG) reached agreement on the high level concept for CEFR.
- Initial human-in-the-loop simulations indicated acceptance by ALPA and UPS pilot participants for separation responsibility based on use of the CDTI.

However, additional issues must be resolved before high fidelity simulations and flight testing can occur. For this reason, the SSG supports continuing to resolve these issues, for the specific purpose of driving toward a decision to proceed with high fidelity simulations in 3rd Quarter of FY03. Key factors that will influence a decision to proceed include:

- Flight standards and air traffic approval of the initial concept and procedures.
- Continued pilot and controller participation in the research and development of the application.

Based on a decision to move forward, draft detailed procedures (for AFM/7110.65) will be developed by 4th Quarter FY03. In conjunction with this, an Operational Safety Assessment and High Fidelity Simulations will be conducted in the first two quarters of FY04. Initial flight-testing is planned for the end of FY04.

Upon successful completion of the initial flight tests, Ops Spec / 7110.65 approval for initial CEFR implementation at key site (SDF) will occur no earlier than FY05 (individual aircraft fleet STCs). In-service evaluation and metrics collection at key site to validate the operational procedures and benefits will occur in the 12 to 24 months following initial implementation.

- Completion of the above activities will provide the basis for making the decision for implementation beyond the key site. Expansion will occur on airport-by-airport basis, with selection based on equipage capability.
- In the mid-term we will investigate adaptations, if necessary, to the procedure or equipment to perform the application during limited periods of IMC at runways that nominally support independent ILS operations (i.e. runways spaced > 4,300 feet).
- In the long-term, we will investigate use of the application during limited periods of IMC at runways that nominally require dependent ILS approaches (i.e. runway spacing between 3,000 feet and 4,300 feet). The final step will investigate use of the application at Closely Spaced Parallel Runways (i.e. runway spacings less than 3,000 feet). It is anticipated that adapting the application to parallel runways spaced at less than 4,300 feet under limited IMC will entail significantly more schedule risk than for the first two steps (i.e., for single runway and independent ILS parallel runways).

Key Decisions

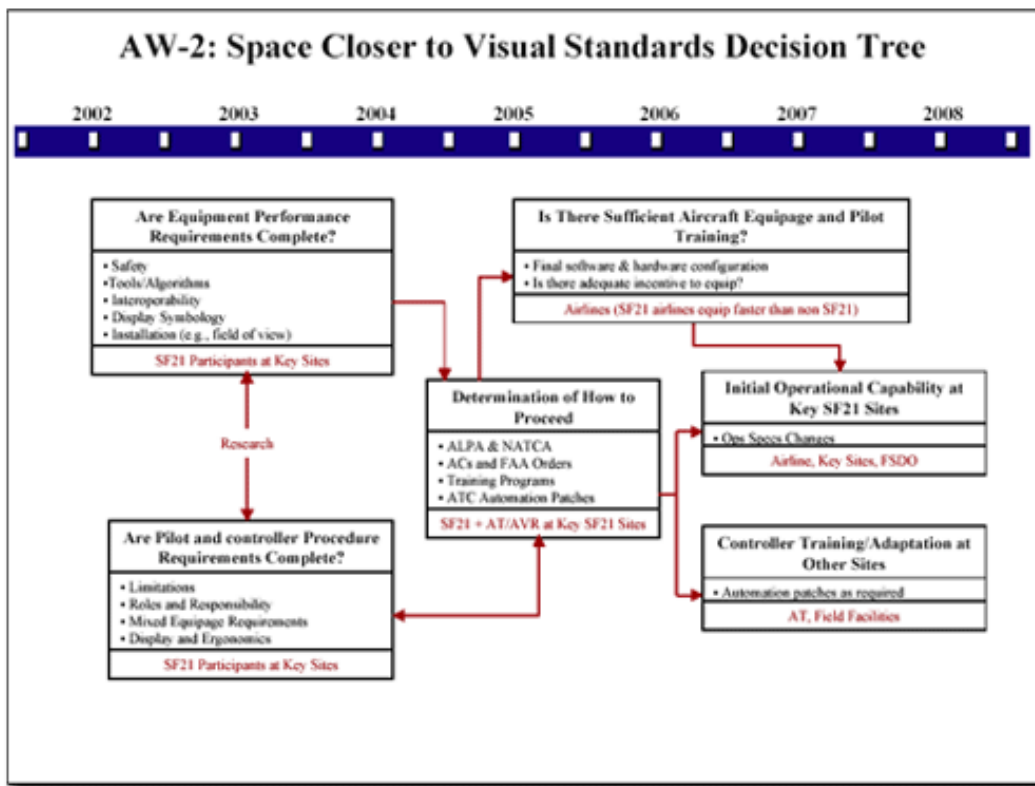
- Decision to proceed with the Continued Visual Approach development via high-fidelity simulation, as based on progress achieved in medium-fidelity human-in-the-loop testing. This decision will be made by the SSG and will be based on approval of major stakeholders (Air Traffic, Flight Standards, Aircraft Certification, ALPA, CAA, NATCA). Any additional time that may be required to adequately resolve issues beyond 3rd quarter FY03 must be specifically approved at that time, as such a decision will result in a slip of the milestones.
- Decision to proceed to Flight Testing, as based on results of high-fidelity simulation. Decision to proceed will be made by the SSG and will be based on approval of major stakeholders (Air Traffic, Flight Standards, Aircraft Certification, ALPA, CAA, NATCA). This decision is currently estimated for April 2004.
- Once high-fidelity flight simulations, flight testing, and Operational Safety Assessments have been completed, proceed with initial CEFR in-service evaluation at key site (Louisville/SDF).
- Site selection based on collaborative decision between affected parties (e.g.: aircraft operator/pilots/FAA).
-

- Flight Standards / Air Traffic approval of initial concept / procedures.
- Aircraft Certification approval of equipment installation for this application (amended STCs as needed).
- Flight Standards District Office (FSDO) approval of airline Operations Specifications change.
- Satisfactory in-service evaluation.
- Air Traffic (AT) letter of authorization to allow extension of procedure to lower weather minimums at key site.
- AT approval to change of national 7110.65, to allow extension of procedure to lower weather minimums.

Key Risks

- Acceptable resolution of separation responsibility issues.
- Business case for equipage.
- Feasibility of procedures in mixed equipage environment.
- Impact of mixed equipage on achievement of benefits.
- Pilot acceptance.
 - Acceptable workload in real-world conditions (e.g. full mission environment, varying winds, etc).
 - Adequate terrain protection when terrain not visible.
 - Adequate resolution of wake vortex avoidance issues.
 - Acceptable application toolset (e.g. map depictions, alerting and/or cueing requirements, etc).
 - Display location.
- Operator acceptance.
- Controller acceptance.
 - Acceptable workload.
 - Acceptable compatibility with current operations.
 - Ability to identify equipped aircraft.
- Integration of ADS-B into ARTS and STARS automation systems.
- Operational applicability.
 - Ability to operate at straight-in single runways.
- Ability to support various parallel runway operations (runways spaced > 4300' apart, runways spaced between 2500 and 4300', and runways < 2500' apart).

Decision Tree



[View enlarged decision tree](#)

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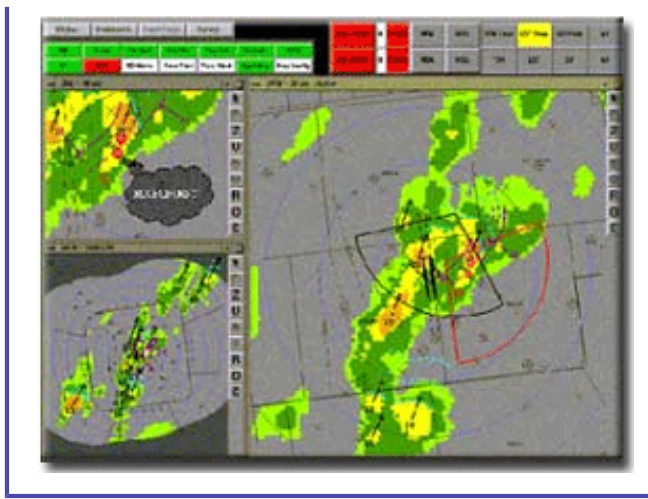
Working Forums

Other Websites

AW-3:

Reconfigure Airports Efficiently





Changes in wind direction over airport runways, and the onset or end of hazardous weather in the vicinity of the airport often require changes to airport arrival and departure configurations. Weather changes can result in a significant disruption of traffic flow if required configuration changes are not known in advance. With improved airport weather observations and predictions, traffic flow configurations can be proactively planned and coordinated among personnel at all of the involved air traffic control and airline operations facilities. The result will be smoother reconfigurations, optimization of traffic flow and reduced congestion at the airport. Prototypes are currently being used for this purpose at six airports. By the end of 2004 the enhanced reconfiguration capabilities will be available at 18 sites covering 31 airports.

Key Activities:

Full operational capability at Atlanta	Dec 2002
Implementation at Kansan City, Houston, St Louis, Chicago, Potomac and New York	Sep 2003
Implementation at Boston, Pittsburgh, Cincinnati, Detroit, Philadelphia, Indianapolis, Denver and Cleveland	Sep 2004

Smart Sheet:
Version 5.0, December 2002

AW-3: Reconfigure Airports Efficiently

Timely planning and coordination of configuration changes during changing weather conditions.

Background

Significant changes in wind direction over airport runways, or the onset/end of hazardous weather in the airport environment, often require changes to the airport departure and arrival configurations. The onset of hazardous weather can result in major disruptions of traffic flow unless there is advance knowledge of configuration change requirements. With this understanding, the FAA is deploying systems that will assist users in making better informed decisions, thus minimizing disruption to traffic flow during weather events while maintaining the safety of the system.

Operational Change Description

Accurate information regarding the location and severity of hazardous weather or changes in wind direction will enable optimal use of airspace, runways, and terminal facilities during the weather event. Delays will be

reduced; operational efficiency and capacity will increase. The Integrated Terminal Weather System (ITWS) is a weather information platform that provides improved weather predictions and observations to traffic management personnel. Traffic managers will be able to use that information to proactively plan traffic flow reconfiguration and to coordinate with personnel in the TRACON, ARTCC, ATCSCC and dispatchers in AOCs. Current plans call for ITWS to be located at 34 sites providing coverage for 47 airports. Coverage will include high traffic airports, particularly those where thunderstorms occur frequently, thus maximizing delay reduction benefits throughout the NAS.

No formal changes to operational rules and procedures are anticipated. However, overall improvement in coordination and ATC efficiency is expected as the ITWS provides a single, reliable source of significant real-time weather information to users.

ITWS prototype operations at NY airports (EWR, LGA, JFK, and TEB) are addressing adjacent airport coordination; several other ITWS sites will also include multiple airport environments. Common situational awareness of weather scenarios—especially, those affecting traffic routes and potential reconfigurations—among decision makers at adjacent airports is significantly improved as ITWS is deployed. Procedures and coordination already in use at these sites will be enhanced by the timelier and more accurate information provided by ITWS.

The AW-3 Solution Set will consist of the following:

AW-3.1: Efficient Airport Reconfiguration in Response to Hazardous Weather

AW-3.2: Efficient Airport Reconfiguration in Response to Wind Changes

Benefit, Performance, Metrics

Improved situational awareness with regard to weather promotes greater efficiency in the management of terminal air traffic activities; the result is a decrease in the number and duration of delays. Extensive experience with four prototypes over the past eight years have enabled users to measure direct operational benefits:

- Departure and Arrival Delay
 - Increased number of arrivals
 - Reduction in number of departure delays
 - Reduction in downstream delays
- Ground Stop Management
 - Fewer unnecessary ground stops
 - Shorter ground stops
- Diversions
 - Fewer diversions due to landing more arrivals
 - Anticipate diversions sooner

The majority of ITWS benefits fall into the category of delay reduction. However, microburst prediction, lightning warning, and indications of severe storm location and intensity contribute to improved safety, as well.

AW-3.1 Efficient Airport Reconfiguration in Response to Adverse Weather

Scope and Applicability

ITWS will provide accurate graphical depictions of current and predicted location and movement of hazardous weather that will affect airport acceptance rates. TMU specialists, supervisors, and dispatchers will be able to anticipate—rather than just react to—hazardous weather. Coordinating the movement of traffic through alternate arrival/departure routes will result in overall increases in capacity and reduction of delays.

The procedural improvements that rely on ITWS include:

-

Runway Management

- Recognize that a runway will remain open
- Better timing of runway shifts due to storms
- Better anticipation of runway operation restart

• Arrival Transition Area (ATA) Management

- Earlier shifts to alternative ATA
- Shift arrivals to more direct ATA sooner

• Departure Transition Area (DTA) Management

- Anticipate DTA closure sooner
- Balance traffic through DTAs during storm passage

ITWS capability has been demonstrated extensively. Prototypes have been in use at selected sites since 1994, including EWR, LGA, JFK, DFW, MEM, and MCO. Additional systems have been installed for operational testing at the Kansas City and Houston airports. The first production system achieved Initial Operational Capability (IOC) in Atlanta in July 2002 and assessment of operational benefits is continuing at that location. Deployment plans call for 6 new sites in 2003 and 8 more in 2004.

Initial deployment of ITWS will integrate the information from weather sensors (TDWR, NEXRAD, LLWAS, ASR-9) in the airport terminal environment. Products include:

- Runway specific warnings up to 2 minutes prior to occurrence of a hazardous microburst.
- Improved determination of gust front location and intensity and the forecasts (10- and 20-minutes) of future gust front positions.
- The location, extent, and intensity of precipitation, along with the current and 10- and 20-minute extrapolated position, extent, speed, and direction of individual storms.
- Improved anticipation of wind shear impacts

These products will be available to flight crews and air traffic planners, and will enable potentially impacted airports to implement safe alternative traffic patterns and achieve higher capacity levels throughout the impact period. The products will be provided to the ATCSCC and external users, including airlines, NWS, airport/port authorities, and others—through Volpe and intranet access.

Milestones/Key Dates

- Full Operational Capability at Atlanta: December 2002
- FY03: Kansas City, Houston, St. Louis, Chicago, Potomac, New York
- FY04: Boston, Pittsburgh, Cincinnati, Detroit, Philadelphia, Indianapolis, Denver, Cleveland

Key Decisions

- Agreement among internal and external (e.g., airlines, NWS) users that existing procedures for airport reconfiguration are sufficient to accommodate planned ITWS deployment.
- FAA decision on revised cost and schedule baseline.

Key Risks

- Maintaining schedule

AW-3.2 Efficient Airport Reconfiguration in Response to Wind Changes

Scope and Applicability

Changes in wind direction at NAS pacing airports often cause air traffic delays. When the wind changes, air

traffic controllers have to change the direction from which aircraft land and take off, that is, “turn the airport around.” Advance knowledge of wind shift changes can save the 15 to 20 minutes needed to reposition aircraft.

ITWS capability can be enhanced to track and display wind shift changes well beyond the immediate terminal area. An algorithm would assimilate and process surface wind data from various sensors (i.e., Automated Surface Observing System (ASOS)/Automated Weather Observing System (AWOS), Low Level Windshear Alert System (LLWAS), radars (Terminal Doppler Weather Radar (TDWR) or Airport Surveillance Radar (ASR)-9)), taking measurements from between 50 to 100 nm from the airport in order to detect and track wind shift changes as they near the airport. Such a detection and “nowcast” (very short-term forecast) capability will provide traffic management specialists with ample planning time to sequence and position arriving aircraft into favorable approach corridors, both before and after the wind shift occurs at the airport. Ground controllers will be able to do the same with departing aircraft.

This is concurrent with the aforementioned system deployment.

Milestones/Key Dates

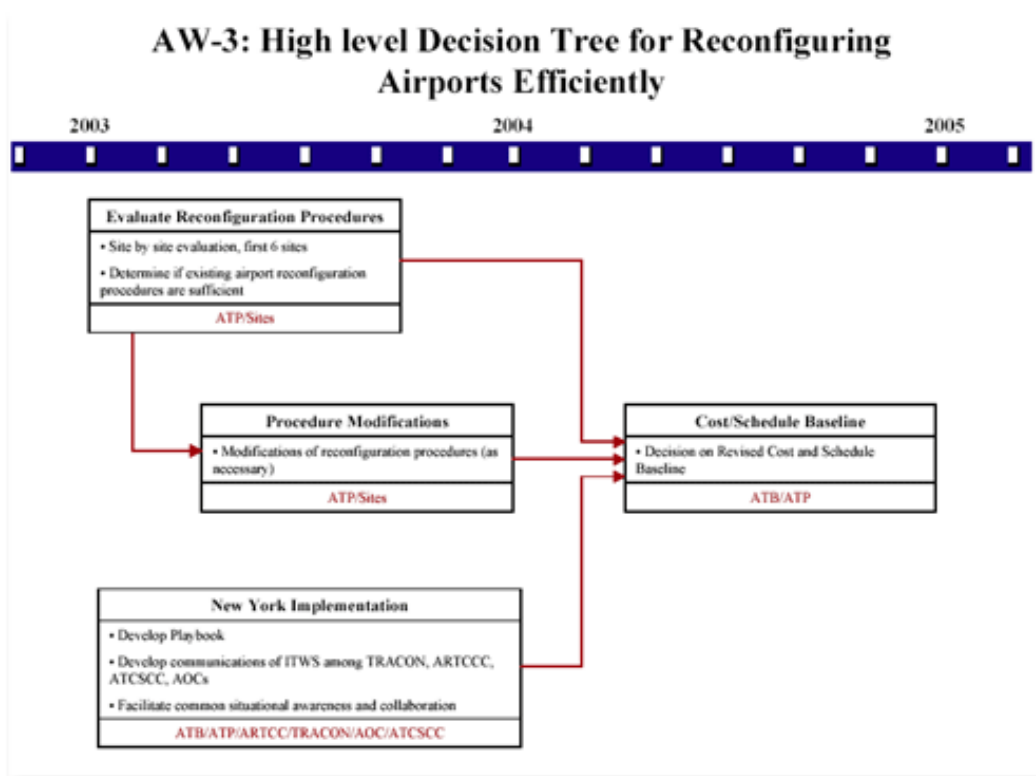
- Full Operational Capability at Atlanta: December 2002
- FY03: Kansas City, Houston, St. Louis, Chicago, Potomac, New York
- FY04: Boston, Pittsburgh, Cincinnati, Detroit, Philadelphia, Indianapolis, Denver, Cleveland

Key Decisions

- Define the solution for the New York area in terms of ITWS & CIWS, prototypes or production models

Key Risks

Decision Tree



[View enlarged decision tree](#)

Responsible Team

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Working Forums

Other Websites

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AW-4

Enhanced All-Weather Surface Operations



During low visibility through zero-visibility surface operations, the pilot and controller both lose the visual references that are key components to situational awareness that supports safe and efficient surface movement in good visibility conditions. As a result, the surface operations are slowed and efficiency is greatly reduced. Prototype demonstrations of cockpit surface movement maps have shown promise in improving crew situational awareness in low visibility. These tools supplement the pilot's out-the-window assessment of aircraft position, direction and speed. When coupled with positive identification of other surface traffic, procedures can be changed to direct one aircraft to follow another without visual references outside the cockpit. These changes may enhance pilot confidence and efficiency in moving about the airport surface. The key to success for this initiative as an OEP capacity enhancement is the ability to go beyond improvement in situational awareness to improved efficiency in surface movement.

Key Activities:

UPS Equipage Louisville	2002
UPS Supplemental Type Certification	2002
Surface Operational Safety Assessment	2002
Airport Surface Maps to top 64 Airports	2003

UPS Crew coordination changes at Louisville	2003
AT procedural changes at Louisville	2004
Measurement of actual performance improvements at SDF	2004

Smart Sheet:
Version 5.0, December 2002

AW-4: Enhanced All-Weather Surface Operations

Improved surface navigation and traffic situational awareness for pilot

Background

In today's environment, the pilot uses visual references and navigation aids and air traffic controller communications to determine aircraft position on the airport surface, and uses visual references to maintain separation from aircraft and other vehicles. The controller also uses visual references to manage traffic with surveillance and automation providing advisory information. While the air traffic controller is responsible for separation on the runway, the pilot is responsible for separation while taxiing to the runway or gate, regardless of airport visibility. In today's environment, taxi workload is normally divided between Pilot Flying (PF) and Pilot Not Flying (PNF). PF typically steers the aircraft using visual techniques. The PNF typically backs up the pilot by monitoring progressive taxiing with paper maps, and handles communication with ATC. During low visibility through zero-visibility, the reduced ability to see signage can lead to confusion in navigating the aircraft on the surface. The inability of the pilot and the controller to "see" the picture in reduced visibility leads to greatly reduced operations on the surface. It is also important to note that regardless of the meteorological conditions, improvements in the cockpit situational awareness will have an impact in the area of safety as well as capacity.

Operations Change Description

The ultimate goal, as expressed in the NAS Concept of Operations, is to have Visual Meteorological Conditions (VMC) like operations in zero-visibility conditions. There are research activities in place at NASA and other facilities to investigate how this may ultimately be achieved. There are also incremental steps that lead to that goal.

- One such activity is the research, development and implementation of multi-function displays on the flight deck with moving map applications. Flight deck simulation studies performed by NASA over a period of years documented significant reductions in taxi times of 25% to 19% during periods of low/moderate visibility, when pilots used flight deck Surface Moving Map (SMM) displays as an aid. These findings were corroborated by flight tests conducted by the Safe Flight-21 (SF-21) program at Louisville, KY, in October 2000.

Cockpit SMM's provide crews with robust surface navigation information, thus increasing pilot awareness of the aircraft's position on the airport surface and other traffic operating in proximity to the aircraft. These SMM's help the pilot guide aircraft along the surface in accordance with ATC instructions, or in accordance with a self-generated taxi plan in the case of non-towered airports. Initially, these tools will supplement the pilot's out-the-window visual assessment of the aircraft's position on the surface, its direction, and speed. Cockpit and Air Traffic procedural changes will allow ATC to direct one aircraft to follow another aircraft without visual reference outside the cockpit. Crewmembers will make use of the display to monitor progressive taxiing, and to positively identify those aircraft they were directed to follow by ATC instruction. The increased knowledge of exact aircraft placement relative to the airport has been demonstrated to decrease crew workload and improve taxi performance.

As the accuracy of the positions of proximal traffic along with call sign information improves, crews are able to correlate traffic observed on the display with clearances and, when available, outside visual information. With this enhanced understanding of traffic, crews are able to perform their taxi clearance and navigate to departure, or gate, in even zero-visibility conditions.

Benefits, Performance and Metrics

- Improved taxi times at night and under other reduced visibility conditions.
- Average gate to gate times should decrease.
- Reduced fuel burn during taxi.
- Maintaining VMC capacity in Instrument Meteorological Conditions (IMC) visibility will reduce the amount of delay and the number of diversions and cancellations.
- Improved situational awareness in the cockpit.

Scope and Applicability

In today's environment, ATC formulates overall taxi sequence plans, and communicates these plans as a set of instructions to both aircraft and vehicles through radio communications. The biggest challenge for ATC is making sure that the aircraft understands the communications. In executing the taxi plan, ATC uses many techniques such as identification of "company traffic" or other descriptors to ensure that pilots understand their place in the "big picture."

Moving maps should provide the capability to receive and display the same surveillance data to tower controllers, pilots, ramp controllers, and others that are involved with surface operations. These maps are proposed for 59 Airport Surface Detection Equipment -X (ASDE-X) sites.

- FAA SMM Enabling Activities:
 - o FAA-approved Concept of Operation – March 2002
 - o FAA to complete all Key Site activities at Louisville Airport (SDF), including Surface Operational Safety Assessment – November 2002; the in-service evaluation and metrics collection Sep 2001- Sep 2005
 - o Deliver airport surface map database for top 65 airports – February 2003
- Airline Certification and Installation Plans:
 - o United Parcel Service (UPS) Supplemental Type Certification for SMM in Boeing 757 – October 2002

Benefits measurements have, to date, only been simulated. It is anticipated that equipage of the UPS fleet with SMM's at their SDF Hub facility will provide the first opportunity to measure actual performance improvements. If the bottleneck is at the departure end of the runway, increased throughput on the surface will not result in significant capacity benefits.

It is also important to note that an early application of this technology will be the introduction of the "moving map" as a tool to enhance situational awareness in all meteorological conditions. This opportunity will enhance the safety of the operation on the surface, while also benefiting capacity and efficiency at the airport during those periods where confusion may exist between the controllers and pilots.

Key Decisions

- Crew coordination changes will be needed to make the most of new SMM information in the cockpit.
- Until very advanced operations are approved, the surface applications should be in support of the visual maneuvering of the aircraft and should only be used in an advisory role.
- SF-21 is currently anticipating UPS to commit to installing SMM's, starting with their 757 fleet in October 2002.
- Beyond UPS, all airlines will have to commit to equipping their fleet with SMM's.
- Procedures for low visibility operations using surveillance and displays as position source for both

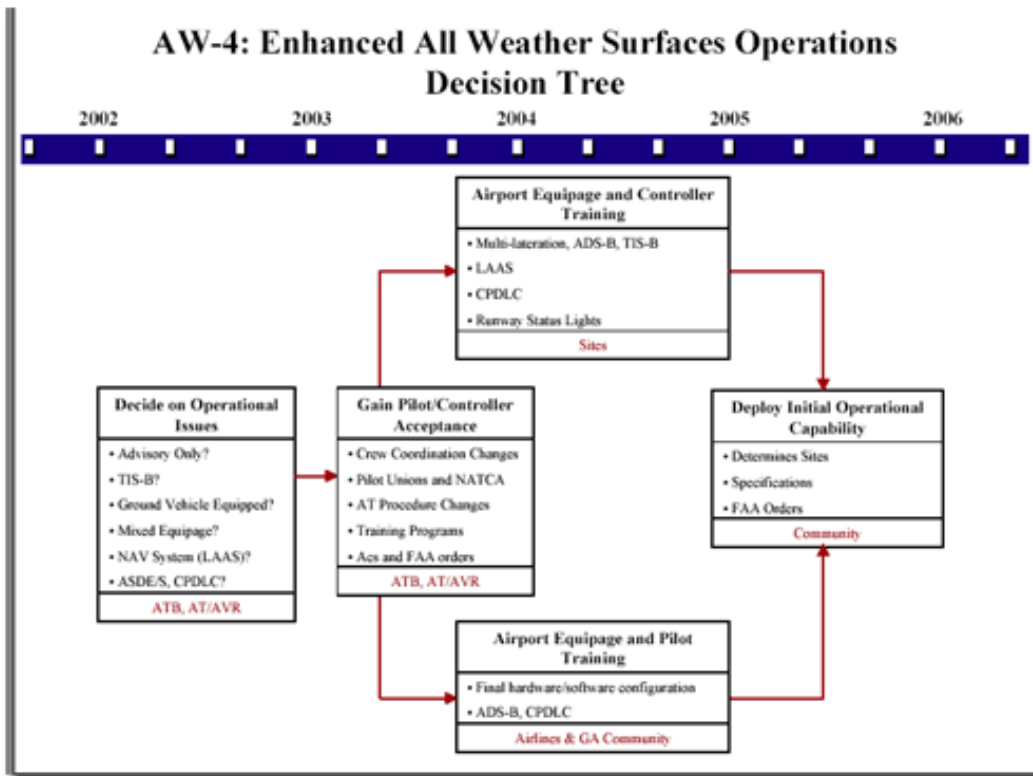
controller and pilot.

- Develop certification criteria for use of surveillance systems and displays for separation procedures on the surface including runway operations.

Key Risks

- Operations fall back to the current mode when position sensors (e.g., GPS-based signals) are not providing adequate accuracy or integrity (depending on the complexity of surface application) or if there is a problem with onboard avionics.
- Failure on the part of UPS to start equipping its fleet with SMM's will significantly impact our ability to implement this capability or measure anticipated benefits.
- Contingent on continued funding, SF-21 must continue maturing the technology and deliver several critical items including:
 - Resolution of cockpit human factors/workload issues (heads-down time, surface clutter, day/night visibility, and display scale, heads up/down).
 - Development of "Call Sign" Procedure for initial use at SDF.
 - Development of Map Data Base for the top 60 airports.
 - Operational Safety Assessment to support certification.
- Managing change: acceptance of new procedures based on new technologies, from both the ATC and aircraft operators' perspectives.
- Feasibility of procedures in mixed equipage environment.
- Beyond the initial applicant, expanding the use of SMM for use at other airports.

Decision Tree



[View enlarged decision tree](#)

Responsible Team

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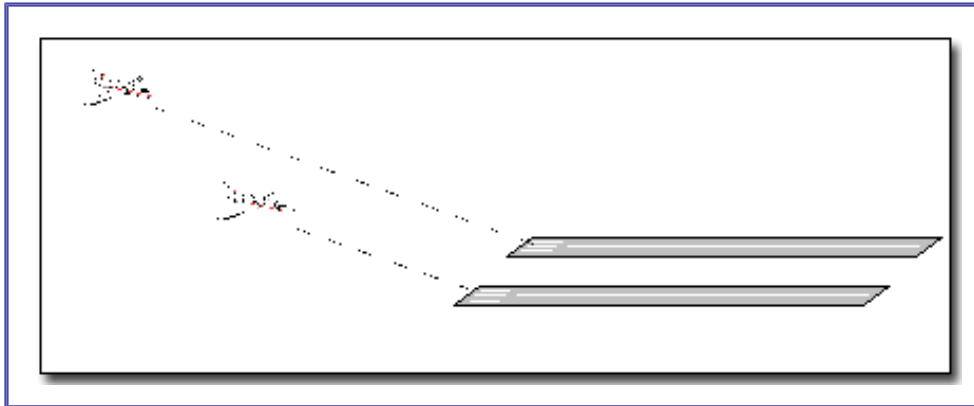
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Working Forums

Other Websites
[Relationship to the Architecture](#)

AW-5

Maintain Optimum Runway Use at Airports with Closely Spaced Parallel Runways



When simultaneous operations based on visual procedures must be discontinued, the operation must be conducted as if the airport had only a single runway for arrivals. All arrivals must be sequenced by air traffic controllers into a single stream and the reduced arrival rate is practically 50 percent of the optimum rate.

Additional measures providing an equivalent level of safety for simultaneous operations to closely spaced parallel runways as compared to simultaneous operations to widely spaced runways, will allow airports to maintain an optimum runway use for longer periods of time as weather deteriorates.

Key Activities:

Analysis plans for wake studies	2/03
Test plans and milestones for wake studies	3/03
Resume PRM operations at MSP	FY03Q2
Determine feasibility of along track separation	9/03
Complete initial study on along track Separation	12/03

Smart Sheet:
Version 5.0, December 2002

AW-5: Maintain Optimum Runway Use at Airports with Closely Spaced Parallel Runways

Optimize Closely Spaced Parallel Runway Operations

Background

The FAA developed capacity benchmarks for the nation's busiest airports. There are three rates for each airport – an optimum rate based on good weather conditions and two reduced rates based on marginal weather and adverse weather conditions, which may include poor visibility, unfavorable winds, or heavy precipitation.

Of the top 35 delayed airports in the NAS, 16 have closely spaced parallel runways (parallel runways with centerlines separated by less than 4,300 feet) and 5 of the 8 pacer airports have closely spaced parallel runways. During visual meteorological conditions, simultaneous departures and arrivals may be conducted at those airports based on the use of visual procedures. Airport operations are relatively efficient and delays can be minimized. As weather conditions deteriorate, simultaneous departures and arrivals based on visual procedures must be discontinued and standard instrument flight rules (IFR) aircraft separation must be provided.

Current FAA IFR separation standards and procedures stipulate that with conventional terminal radars, with an update rate of approximately 4.8 seconds, simultaneous independent approaches can be conducted to parallel runways with centerlines separated by at least 4,300 feet. Standard in-trail separation is provided between aircraft on the same approach course. At locations where the parallel runways are less than 4,300 feet but at least 2,500 feet apart, parallel dependent (staggered) approaches may be conducted. Parallel dependent approaches do not provide the optimum rate that would be available if simultaneous independent parallel approaches could be conducted. At airports with closely spaced parallel runways, the ability to conduct simultaneous independent approaches could support a potential 25 percent increase in airport arrival rates over parallel dependent approach arrival rates. When the runways are separated by less than 2,500 feet apart, parallel dependent approaches cannot be conducted at all. When simultaneous operations based on visual procedures must be discontinued, the operation must be conducted as if the airport had only a single runway for arrivals. All arrivals must be sequenced by air traffic controllers into a single stream and the reduced arrival rate is practically 50 percent of the optimum rate.

Ops Change Description

The large variations in arrival acceptance rates at major airports resulting from poor visibility or low cloud ceilings have a significant impact on system delays and create problems for air carriers to maintain scheduling integrity. With respect to departures from parallel runways separated by less than 2,500 feet, the ability to support the optimum rate in all weather conditions and for all aircraft types when visual procedures cannot be utilized would have a significant impact on the efficiency of airport operations.

FAA study and analysis helps determine whether additional measures must be implemented to provide for an equivalent level of safety for simultaneous operations to closely spaced parallel runways as compared to simultaneous operations to widely spaced runways. Such measures may include the use of high update rate surveillance technology to monitor aircraft on final approach, special pilot and controller training, or wake turbulence research to identify alternative wake mitigation measures for parallel runways separated by less than 2,500 feet.

Recent experience has demonstrated that when additional requirements are implemented to support closely spaced parallel runway operations, user and service provider participation is critical to ensure that necessary training is accomplished or additional equipment is installed and operated. A very high level of user and service provider participation rate is necessary to support the overall efficiency of the closely spaced runway operation. The closer that the closely spaced operation resembles current procedures and operating practices, the greater the prospects for full participation and the sooner that efficiency benefits can be realized.

The following sections address operational changes described:

- [AW-5.1:](#) Implement Enhanced Surveillance Capabilities and Procedures to Support Simultaneous Approaches to Closely Spaced Parallel Runways in Deteriorating Weather Conditions.
- [AW-5.2:](#) Wake Turbulence Research and Development Effort to Enhance Operations for Closely Spaced Parallel Runways.
- [AW-5.3:](#) Research and Development of the Along Track Separation Concept to Improve Airport Arrival Capabilities in Instrument Meteorological Conditions.

Benefits, Performance and Metrics

- Runway operations per hour are sustained at a higher level during inclement weather.

AW-5.1 Implement Enhanced Surveillance Capabilities and Procedures to Support Simultaneous Approaches to Closely Spaced Parallel Runways

Scope and Applicability

The intended benefits of PRM include increased throughput, reduced delays, and improved fuel savings. The FAA selected Kennedy, Minneapolis, St. Louis, Atlanta, and Philadelphia as candidate airports. The Administrator subsequently agreed to support additional sites at San Francisco and Cleveland with a commitment to accommodate Atlanta at the appropriate time.

Near-Term:

- National criteria and guidance for constructing and operating SOIA to parallel runways separated by at least 750 feet apart and less than 3,000 feet apart at FAA-designated airports completed. Associated air traffic document changes are being finalized.
- Installation of PRM at San Francisco and Kennedy.
- Implementation of PRM-SOIA operations at St. Louis and San Francisco with associated wake safety assessments.

Mid-Term:

- Further site-specific SOIA procedure development as new PRM sites are approved and utilized.
- Address enhanced surveillance capability at Detroit and Atlanta.

Long-Term:

- Further site-specific SOIA procedure development as new PRM sites are identified and approved.

Key Decisions

- Finalization of PRM/SOIA procedures.
 - ATC procedures.
 - PRM pilot training requirements.
- Obtain necessary MOUs.
- Enhanced surveillance technology decision for sites beyond the near term.

Key Risks

- Efficiency benefits may not be realized unless users and service providers fully support and accept PRM-SOIA procedures.
- PRM-SOIA procedures are dependent on specific runway configuration and associated equipment siting requirements. It may not be possible or beneficial to conduct PRM-SOIA at every airport.
- Funding PRM Supportability Action Plan.
- Unless participation issue is resolved, there may be no benefit at Kennedy.
- If an enhanced surveillance capability is not available, the benefits of a new runway may not be realized.

AW-5.2 Wake Turbulence Research and Development Effort to Enhance Operations for Closely Spaced Parallel Runways

Background

In accordance with current FAA wake turbulence standards, when closely spaced parallel runways are separated by less than 2,500 feet, arrival and departure operations must be conducted as if the airport had only a single runway. As a result, the operational efficiency of the airport is reduced to a rate that is significantly lower than the optimum rate. The reduced runway operations rates at major airports have a significant impact on system delays and create problems for air carriers to maintain scheduling integrity.

A reduction in the wake turbulence standard for Closely Spaced Parallel Runways to a lesser runway separation, along with certification of radar separation standards for operations at the lesser runway separation would enhance the efficiency of operations at many airports in the NAS.

Scope and Applicability

This effort will identify runway separation criteria for wake independent operations on closely spaced parallel runways addressing all operational applications including dual operations with small aircraft operating independently from other small aircraft; dual operations with a large aircraft on one runway and a large or small aircraft on another; and dual operations with heavy aircraft on one runway and a heavy, large or small aircraft on the parallel runway. In addition, this effort will validate the revised CSPR wake turbulence criteria and validate reductions in the associated radar separation criteria to support arrival and departure operations to or from runways separated by less than 2500 feet. This effort is designed to minimize requirements for new equipment, training, or procedures to maximize pilot and controller acceptance and participation and to maximize the potential benefits to be derived.

This effort may be applicable to 11 of the 35 OEP airports, after validation at one or more of these sites.

Near-Term:

- Identification of revised CSPR wake turbulence runway centerline separation requirements.
- Development of validation criteria in partnership with stakeholders.
- Implementation of initial CSPR validation effort at selected site(s).
- Development of efficiency benefits metrics.
- Collision risk assessment of 1.5 nm staggered approach to runways separated by less than 2500 feet.

Mid-Term:

- Implementation of revised separation standards based on validated CSPR wake turbulence requirements.
- Incorporation of new procedures/standards, as appropriate, into FAA directives.

Long-Term:

- Planning and construction of new runways enabled by the new CSPR wake separation standards.
- Continued wake research to address additional wake capacity constraints.

Key Decisions

- Identification, prioritization, and support for resources for FAA analyses to develop and validate the wake turbulence standards and the new separation standards for CSPR.
- Sites selected for validation.
-

Validation criteria.

Key Risks

- Pilot and controller participation and acceptance.
- Limited applicability of new standards.

AW-5.3 Research and Development of the Along Track Separation Concept to Improve Airport Arrival Capabilities in Reduced Visibility Conditions

Scope and Applicability

The FAA has received several delay reduction/capacity enhancement proposals that are identified as, or are associated with the Along Track Separation (ATS) concept. Many concepts propose to take advantage of site-specific runway configurations or the availability of on-site equipment such as a high update rate surveillance system.

While further research may identify the need for additional measures to provide for an acceptable level of safety, the FAA believes that the greatest benefit derived from a research and development (R&D) effort of the ATS concept would be to base the concept on current, conventional systems and procedures to minimize requirements for new or additional equipment, training familiarization, and other system integration impacts thereby maximizing the potential participation by pilots and controllers.

The initial research and development will focus on a generic concept with the broadest possible application with a minimum of additional requirements. Initial research and development effort will focus on those elements that all of the stakeholders' proposals have in common. Those elements are:

1. Dual straight-in ILS (or a straight-in ILS and an offset, by no more than 3 degrees, ILS) approaches to parallel runways with centerlines separated by less than 2,500 feet.
2. Application of parallel dependent separation criteria (1.5 nm diagonal spacing) between aircraft on the adjacent approaches.
3. Application of either standard in-trail wake turbulence separation criteria between aircraft on adjacent approach courses in lieu of lateral approach course separation, or an as-of-yet-to-be-determined wake mitigation procedure that provides for an equivalent level of safety.

Near-Term

- Determine feasibility of along track separation concept.
- Completion of initial study.
- Develop and validate approach procedures using collision risk and wake assessments.

Key Decisions

- Identify the minimum operational and procedural requirements to support the safe application of ATS to Category I, II, and III minima for a straight-in ILS approach; and 200-foot minima or less for an offset ILS or an LDA with glideslope offset by up to 3 degrees.
- Operational and procedural requirements should, to the maximum extent practicable be based on existing procedures and phraseology as specified in FAA Order 7110.65 and should not require changes to approach plate design or nomenclature.
- Identification of minimum separation required between aircraft on adjacent approach courses including applicable wake vortex mitigation requirements
- Identification of minimum runway centerline spacing required to support along track separation. The centerline spacing criteria must be applicable to all parallel runway configurations and take into

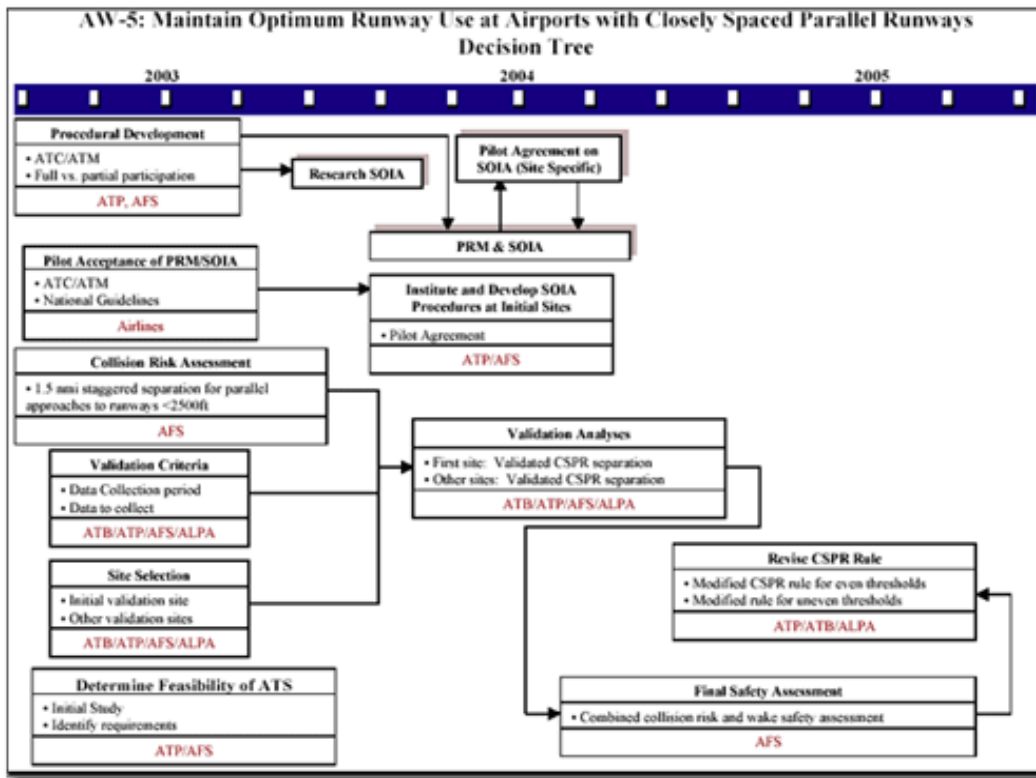
consideration staggered or even thresholds.

- Identification of phraseology to support along track separation.

Key Risks

- Development of national criteria and requirements for along track separation.
- Dependency on a one-second update surveillance source.
- Limited applicability.
- Implementation costs.
- Pilot and controller participation and acceptance.

Decision Tree



[View enlarged decision tree](#)

Responsible Team

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Working Forums

Other Websites

[Relationship to the Architecture](#)